

Table of content

| | |
|--|----------|
| 1. General | 1 |
| 2. Product overview | 1 |
| 3. Functionality and API commands | 2 |
| 3.1 Measure weight difference | 2 |
| 3.2 Pick-up and place-back detection | 3 |
| 3.3 Absolute weight measurement | 5 |
| 3.4 Sensor calibration | 5 |
| 4. Installation requirements and guidelines | 6 |
| 4.1 Connection Diagrams | 6 |
| 4.2 Hardware integration guidelines | 7 |
| 5. Settings | 8 |
| 6. Quick test | 9 |

1. General

The XZ Weight sensor can accurately measure the amount of weight which is placed on the sensor, and swiftly detect weight deltas. Typically, this feature is used to determine whether an object, such as merchandize in a store, is picked-up or placed back. This document provides explanation of the available functionalities and instructions on how to install and integrate the sensor into your digital signage installation.

The information in this document is created for users who are familiar with the Nexmosphere API and are able to control a basic setup with a Nexmosphere API controller. If this is not the case yet, please read the general documentation on the Nexmosphere serial API first.

2. Product overview

The XZ Weight sensor bar type is available in 3 models:

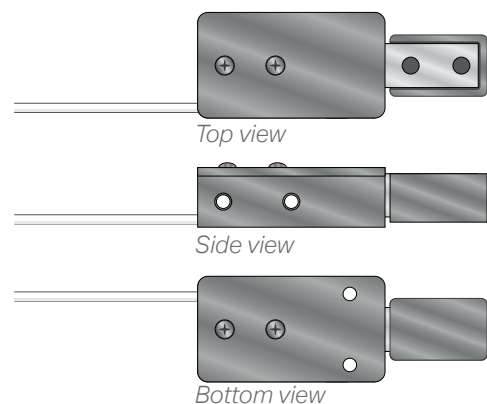
| | XZ-W11 | XZ-W21 | XZ-W51 |
|----------------------------------|--------|--------|--------|
| Weight measurement | ✓ | ✓ | ✓ |
| Pick-up detection (weight delta) | ✓ | ✓ | ✓ |
| Anomaly detection | ✓ | ✓ | ✓ |
| Maximum total weight | 10KG | 20KG | 50KG |
| Minimum item weight | 5g | 5g | 5g |
| Accuracy | 0.5-2g | 1-3g | 2-4g |



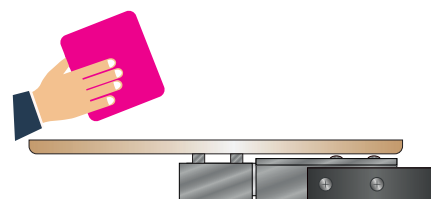
XZ-W11 | XZ-W21 | XZ-W51

The XZ Weight sensor bar type utilizes a Full Bridge Strain Gauge which converts the applied force into an electrical signal. This allows the sensor to accurately measure weight(deltas).

The sensor has 2 ends. The large end is to be attached to a firm structural part of your setup. The platform/panel on which the items are placed is to be attached to the smaller end.



The sensor will only work (responsively) when the applied weight is stable, as is the case when placing a product, or lifting it after. When applying manual force on the sensor, for example with your thumb, the applied weight will typically fluctuate too much for the sensor to be responsive or provide any output at all. Therefore, we recommend to first install the sensor firmly, before testing the API commands. For more information on mechanical installation, please see section 4.2, page 6 and 7.



3. Functionalities and API commands

The XZ Weight sensor provides the following functionalities:

1. **Measure weight differences** - detect if there is a delta in the measured weight
2. **Pick-up and Place-back detection** - detect if a specific item is picked-up or placed-back
3. **Absolute weight measurement** - measure the absolute weight to apply the sensor as a regular weight scale
4. **Sensor calibration** - calibrate the sensor to your setup for an accurate weight measurement

The following sections will cover each of these functionalities in detail. Please note that for each API example in this document, X-talk interface address 001 is used (X001). When the sensor is connected to another X-talk channel, replace the "001" with the applicable X-talk address.

3.1 - Measure weight differences

When an object is placed on the weight sensor, it will detect a positive difference in the measured weight. Vice versa, when an object is lifted from the sensor, a negative weight delta will occur. Per default, the sensor will send an API message in both cases, which have the following format:

| | | | |
|--|--|----------------|-----------------|
| <code>X001B[WEIGHTDIF=-XXXXX.X]</code> | <i>Object lifted (neg. weight delta)</i> | XXXXX.X= grams | 00000.0-50000.0 |
| <code>X001B[WEIGHTDIF=+XXXXX.X]</code> | <i>Object placed (pos. weight delta)</i> | XXXXX.X= grams | 00000.0-50000.0 |

When implementing weight difference triggers, consider the following:

- Per default, the minimum required weight difference to trigger an API message is 10 grams. To adjust this, please see section 5 "Settings", page 8.
- To optimize the accuracy of the weight measurement, it is recommended to calibrate the sensor when installed in the final setup. Please see section 3.4, page 5.
- The sensor has multiple settings to adjust its accuracy and measurement time. Please see section 5 "Settings", page 8.

Example API messages

An object which weighs 21.3 gram was lifted from the sensor connected to X-talk interface 003

```
X003B [WEIGHTDIF=-00021.3]
```

An object which weighs 414.9 gram was lifted from the sensor connected to X-talk interface 006

```
X006B [WEIGHTDIF=-00414.9]
```

An object which weighs 53.7 gram was placed on the sensor connected to X-talk interface 004

```
X004B [WEIGHTDIF=+00053.7]
```

An object which weighs 1129.8 gram was placed on the sensor connected to X-talk interface 001

```
X001B [WEIGHTDIF=+01129.8]
```

3.2 - Pick-up and place-back detection

The sensor can recognize the lift and placement of 16 individual items based on their unique weight, even in the case of subtle differences. In order to do so, the sensor must first be configured with the item properties. This can be done by sending the following API commands:

```
X001B [ ITEM**NAME=XXXXX . . . XXXXX ]
```

Assign a **custom name** to an item

** = item number **01-16**

XXXXX..XXXXX = name of item 1-16 chars

```
X001B [ ITEM**WEIGHT=XXXXX . X ]
```

Assign a **weight value** to an item

** = item number **01-16**

XXXXX.X = weight in grams **00000.0-50000.0**

Alternatively to assigning the weight of the item manually, the sensor can also measure the weight of an item and store this value. To do so, place one or multiple units of the same item on the weight sensor and send one of the following commands:

```
X001B [ ITEM**MEASURE ]
```

Measure and store the weight of an item (**one unit**)

** = item number **01-16**

```
X001B [ ITEM**MEASURE=XXX ]
```

Measure and store the weight of an item (**multiple units**)

** = item number **01-16**

XXX = number of items placed on the sensor **001-999**

When configuring item parameters, consider the following:

- For an accurate item weight measurement, it is **crucial** to first manually calibrate the sensor when installed in the final setup. Please see section 3.4, page 5.
- The minimum weight difference of the items should be higher than the sensor accuracy. Please see the specification overview in section 2, page 1.
- Per default, when no item name is set, the name will be the item number.

When the configuration of an item was successful, the sensor will reply with the following API message:

```
X001B[ITEM**STORED]
```

** = item number **01-16**

In case the weight of an item is below the minimum required weight (see page 1), and an item**measure command is sent, the following error message will occur:

```
X001B[ERROR=CALIBRATION VALUE LOW]
```

Example API messages

Assign name "SUNGLASSES A" to item 3 on the weight sensor connected to X-talk interface 005

```
X005B [ ITEM03NAME=SUNGLASSES A ]
```

Assign name "Cool sneakers" to item 16 on the weight sensor connected to X-talk interface 008

```
X008B [ ITEM16NAME=Cool sneakers ]
```

Assign 37.2 grams as its weight to item 5 on the weight sensor connected to X-talk interface 003

```
X003B [ ITEM05WEIGHT=00037.2 ]
```

Assign 2381.0 grams as its weight to item 1 on the weight sensor connected to X-talk interface 007

```
X007B [ ITEM01WEIGHT=02381.0 ]
```

Measure and store the weight of item 7, which is placed on the sensor connected to X-talk interface 001

```
X001B [ ITEM07MEASURE ]
```

Measure and store the weight of item 5, of which 3 units are placed on the sensor connected to X-talk 002

```
X002B [ ITEM05MEASURE=03 ]
```

PRODUCT MANUAL | XZ WEIGHT SENSOR BAR TYPE

The configuration of the item properties can be requested at any time by sending the following API commands:

| | |
|--------------------------------|--|
| X001B [ITEMPROPERTIES?] | Request all properties for all items |
| X001B [ITEMNAMES?] | Request the set names for all items |
| X001B [ITEMWEIGHTS?] | Request the set weights for all items |
| X001B [ITEM**NAME?] | Request the set name for a specific item **= item number 01-16 |
| X001B [ITEM**WEIGHT?] | Request the set weight for a specific item **= item number 01-16 |

The replies are identical to the commands used to set the properties.

The following API commands can be used to clear the item properties:

| | |
|------------------------------|--|
| X001B [ITEM**CLEAR] | Clear the properties for a specific item **= item number 01-16 |
| X001B [CLEARALLITEMS] | Clear the properties for all items |
| X001B [FACTORYRESET] | Clear the properties for all item and clear the calibration |

When the items are configured, the sensor recognizes the lift and placement of each individual item.

To enable the API output for pick-up and place-back of individual item, the output mode must be adjusted:

X001S [4:1] Item Lift/Place output

In this output mode, the API messages have the following format

| | | | |
|-------------------------------------|-----------------------|---------------------------------|-------------------|
| X001B[PU=XXXXXXXXXXXXXXXXXX] | <i>Item is lifted</i> | XXXXXXXXXXXXXXXXXXXX= item name | 1-16 chars |
| X001B[PB=XXXXXXXXXXXXXXXXXX] | <i>Item is placed</i> | XXXXXXXXXXXXXXXXXXXX= item name | 1-16 chars |

When implementing pick-up and place back triggers, consider the following:

- The minimum weight difference of the items should be higher than the sensor accuracy. Please see the specification overview in section 2, page 1
- Per default, the minimum required weight difference to trigger an API message is 10 grams. To adjust this, please see section 5 "Settings", page 8
- When no name is assigned to an item, the item number will be used as the default name.
- The sensor has multiple settings to adjust its accuracy and measurement time. Please see section 5 "Settings", page 8.

Example commands

Item03 with name "SUNGLASSES A" is lifted from the sensor connected to X-talk interface 005

X005B[PU=SUNGLASSES A]

Item16 with name "Cool sneakers" is placed back on the sensor connected to X-talk interface 008

X008B[PB=Cool sneakers]

Item01 with no assigned name is lifted from the sensor connected to X-talk interface 007

X007B[PU=01]

In case the weight of a placed item does not match any of the stored items, the following message will occur:

X001B[ANOMALY=DETECTED]

When the same item is lifted, the detected anomaly will be cleared and the following message will occur:

X001B[ANOMALY=CLEARED]

3.3 - Absolute weight measurement

The sensor can be set to output the absolute weight value applied on the sensor. In this mode, the sensor can be used as a regular weight scale. To enable the API output for absolute weight values, the output mode must be adjusted. This can be done by sending the following API command:

```
X001S[4:3] Absolute weight output
```

In this output mode, the API messages have the following format

```
X001B[WEIGHT=+XXXXX.X] Absolute weight on sensor XXXXX.X= grams 00000.0-50000.0
```

When implementing absolute weight measurements, consider the following:

- Per default, the minimum required weight difference to trigger an API message is 10 grams. To adjust this, please see section 5 "Settings", page 8.
- The sensor automatically does a base calibration at start-up. For absolute weight measurement, it is important that either the sensor has no item placed on it at start-up, or it is recalibrated after. Please see section 3.4, page 5.
- The sensor has multiple settings to adjust its accuracy and measurement time. Please see section 5 "Settings", page 8.

Example commands

An item weighing 147.8 grams is placed on the sensor connected to X-talk interface 002

```
X002B[WEIGHT=+00147.8]
```

An item weighing 1842.9 grams is placed on the sensor connected to X-talk interface 003

```
X003B[WEIGHT=+01842.9]
```

An item is lifted from the sensor connected to X-talk interface 007

```
X007B[WEIGHT=+00000.0]
```

The absolute total weight currently placed on the sensor can be requested at any time by sending the following data request command: **X001B[WEIGHT?]**

3.4 - Sensor calibration

The sensor will provide the most accurate output when it is calibrated in its final mechanical setup. This only needs to be done once during the setup of your installation. In order to so, please follow the steps below.

Install the sensor

1. Install the sensor onto the fixture (please see section 4.2, page 6 and 7 for more information).
2. Install the platform onto the sensor (please see section 4.2, page 6 and 7 for more information).

Tare the sensor

3. Make sure no object is placed on the platform.
4. Send the following API command:

```
X001B[CALIBRATE=BASE]
```

5. When successful, the sensor will reply with the following command: **X001B[CALIBRATION=DONE]**

The sensor automatically does a base calibration at start-up. This doesn't affect the normal operation of "Weight difference triggers" and "Pick-up and Place-back detection". For "Absolute weight measurement", it is important that either the sensor has no item placed on it at start-up, or it is recalibrated after. The same goes for item measurements (see page 3).

Calibrate the sensor

6. Place an object on the sensor of which the exact weight is known, preferably between 500-1000 grams
7. Send the following API command, with the exact weight of the object. In case of 500.0 grams:

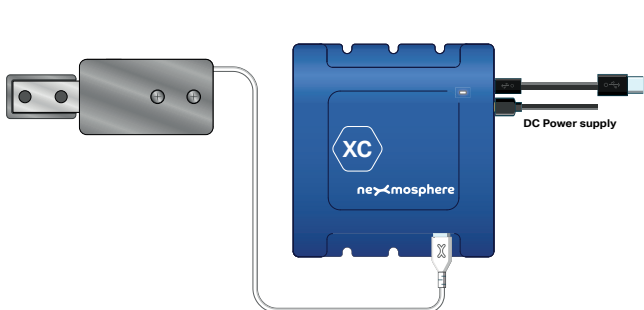
```
X001B[CALIBRATE=00500.0]
```

8. When successful, the sensor will reply with the following command: **X001B[CALIBRATION=DONE]**

The sensor calibration is now completed.

4.1 Connection Diagrams

The XZ Weight sensor can be connected to any X-talk interface and is therefore compatible with all Xperience controllers. Make sure the sensor is connected to the X-talk interface before powering the Xperience controller. Otherwise, it will not be recognized by the Xperience controller and no sensor output will be provided.



Example connection to XC Controller



Example connection to XN Controller

4.2 Hardware integration guidelines

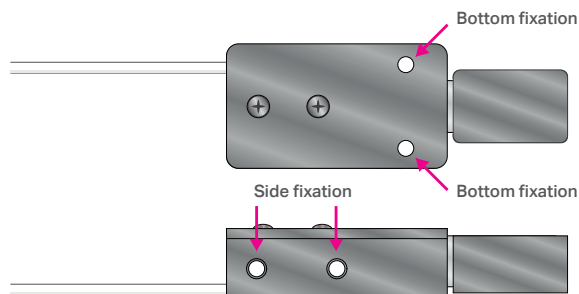
The XZ weight sensor has 2 ends. The larger end is to be attached to a firm structural part of your fixture. The platform/panel on which the items are placed is to be attached to the smaller end of the sensor. The weight sensor will only work stable when installed firmly.

Installation to frame structure

The weight sensor has the following mounting holes available for installment onto the fixture:

- 2x M5 tapped mounting holes for side fixation on both sides
- 2x M5 tapped mounting holes for top fixation

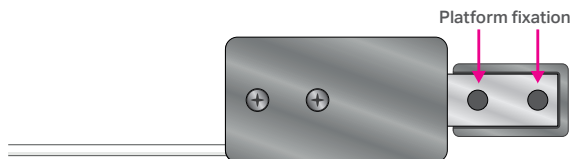
CAUTION: The bolts for side fixation should not exceed 5mm of insertion into the tapped mounting hole. If the max insertion length is exceeded, this can damage the sensor.



Installation of product panel

The weight sensor has the following mounting holes available for installment of the product panel:

- 2x M5 tapped mounting holes for top fixation

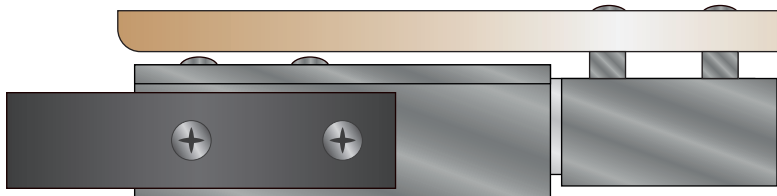


PRODUCT MANUAL | XZ WEIGHT SENSOR BAR TYPE

Installation options

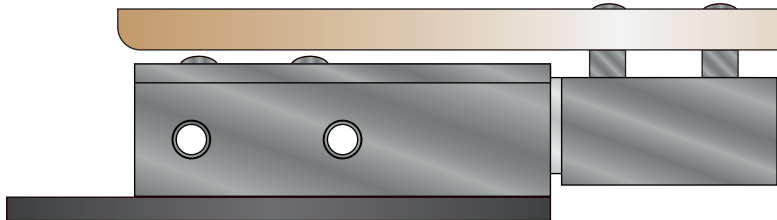
Per default, the sensor can be installed in the following configurations:

Side frame fixation



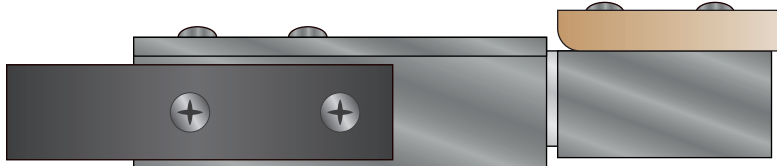
Centred panel fixation with spacers

Bottom frame fixation



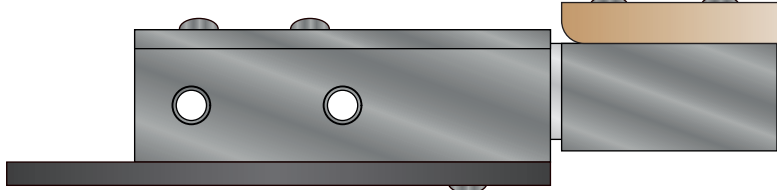
Centred panel fixation with spacers

Side frame fixation



Off centre panel fixation without spacers

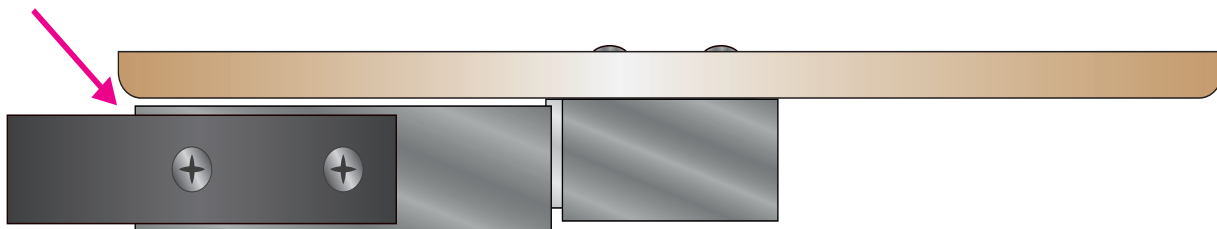
Top frame fixation



Off centre panel fixation without spacers

The cover of the fixture end of the sensor can be removed from the top side. This allows for a larger platform to be installed centred without spacers.

Cover removed



5.1 - Settings

The XZ Weight sensor has multiple settings which determine the behaviour and output of the sensor. The settings can be adjusted by sending X-talk setting commands via the API. After a power cycle, the settings always return back to default.

Setting 1: Status LED behaviour

- | | |
|---------------------------------------|--------------------------|
| 1. LED on | <code>x001s [1:1]</code> |
| 2. LED off | <code>x001s [1:2]</code> |
| 3. LED on, blink at trigger (default) | <code>x001s [1:3]</code> |
| 4. LED off, blink at trigger | <code>x001s [1:4]</code> |

Setting 4: Output mode

- | | |
|-----------------------------------|--------------------------|
| 1. Product lift/place | <code>x001s [4:1]</code> |
| 2. Weight difference (default) | <code>x001s [4:2]</code> |
| 3. Absolute weight | <code>x001s [4:3]</code> |
| 4. No triggers, use data requests | <code>x001s [4:4]</code> |

For more info, please see section 3, page 2 to 5.

Setting 5: Maximum weight deviation between samples

Max. weight deviation (grams) `x001s [5:X]`

X is a value between **1-50** and its default value is **10** grams. This setting specifies the maximum weight deviation between 2 internal weight samples, for them to be considered valid.

The higher the maximum weight deviation, the more responsive but less accurate the sensor will be. The lower the maximum weight deviation, the less responsive but the more accurate the sensor will be.

This setting is related to setting 7, which determines the number of consecutive valid samples the sensor must have for a measurement to be considered valid and generate a trigger.

Setting 6: Minimum weight difference for trigger

Min. weight difference (grams) `x001s [6:X]`

X is a value between **1-250** and its default value is **10**. This setting specifies the minimum weight difference between 2 valid measurements to trigger an API command. This setting applies to the following output modes:

- 4:2 Weight difference (default)
- 4:3 Absolute weight

Setting 7: Sample averaging

Number of samples for averaging `x001s [7:X]`

X is a value between **1-100** and its default value is **4**. This setting specifies the number of valid weight samples which are averaged to determine the sensor's output.

The higher the number of samples, the less responsive the sensor will be to change, but also the more stable in case of challenging environments. The lower the number of samples, the more responsive the sensor will be to change. Please note that typically this setting does not need to be adjusted.

Setting 8: Weight margin for item weight

Weight margin `x001s [8:X]`

X is a value between **1-50** and its default value is **10**. It indicates the percentage which a weight measurement is allowed to differ from the set item weight for it to still trigger a pick-up or place-back command.

The higher the weight margin, the larger the weight range is for every stored item. The lower the weight margin, the smaller the weight range.

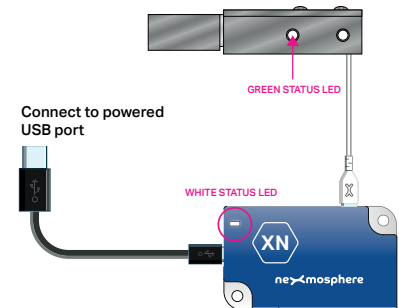
6. Quick test

In order to test if the XZ Weight sensor is installed correctly, please follow the test procedure below:

Step 1 - Setup

First, connect the weight sensor to an Xperience controller. Secondly, power the Xperience controller.

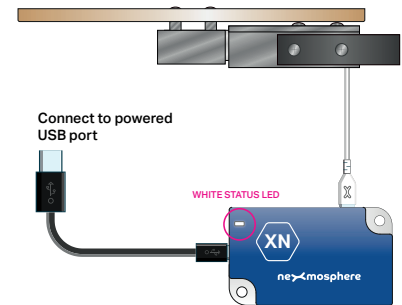
The green status LED of the XZ Weight sensor should go on. The status LED of the controller will start to blink and once power-up is completed will be lit continuously.



Step 2 - Fixate the sensor

Please see page 6 and 7 for installation guidelines.

For quick on-desk testing, you can use a glue clamp to fixate the fixture part to your desk. We recommend to always mount a platform to the sensor with two M5 bolts.



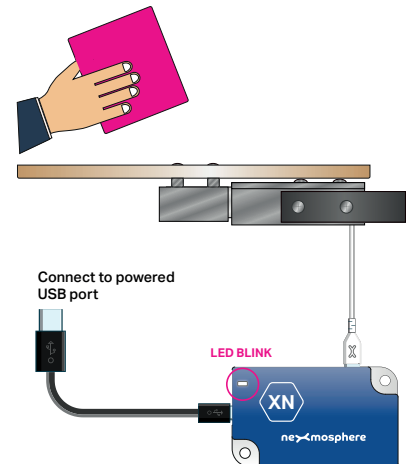
Step 3 - Item placement and item lift

Place an item on the platform which is mounted on the sensor.

The status LED of the controller should blink.

Lift the item on the platform which is mounted on the sensor.

The status LED of the controller should blink.



In case any of the steps above does not provide the expected result, please check the installation guidelines in this document.

For a full test we recommend to connect the setup to a media player or PC and test all API commands listed in this document (see section 3, page 2). For more information on how to setup a test for your controller, please see the Quick Start Guide of the Xperience controller you are using. These are available on nexmosphere.com/support-documentation

Please contact support@nexmosphere.com for any support questions you may have.